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COMMONWEALTH PHYTOPATHOLOGICAL NEWS

A QUARTERLY REVIEW OF NEWS AND VIEWS ISSUED BY THE COMMONWEALTH MYCOLOGICAL INSTITUTE, KEW, SURREY

MAIN ITEMS

Caribbean Quarantine
Timing of Eradicant Sprays
Inoculation Mast
Personal News
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Conferences

PLANT QUARANTINE FOR THE CARIBBEAN

Technique adopted in Trinidad

Plant quarantine regulations and techniques in the British West Indies are adapted to the particular needs of the diversified agriculture and widely scattered territories involved.

While each territory has its own plant protection ordinances and plant inspection organizations there is, at the Imperial College of Tropical Agriculture (I. C. T. A.), in Trinidad, and supervised by a senior member of the College Botany Department staff, a Central Plant Quarantine Station serving the whole British Caribbean and financed by annual contributions from the ten governments concerned. The senior pathologist and the senior entomologist of the College, are consultant members of the Plant Quarantine Committee and are responsible for the regular inspection of all material undergoing quarantine, acting in an advisory capacity to the Director of the Trinidad Department of Agriculture, who, with his specialist officers as members, heads the Committee.

This Committee advises on general quarantine problems throughout the Caribbean territories.

All the territories are to a very considerable degree isolated geographically and with the exception of Jamaica and St. Lucia have at most one airport and one regular seaport, which renders control of entry relatively straightforward.

In Trinidad, the plant protection regulations are so framed that, with certain minor exceptions all importations of plants or plant products require an import permit issued by the Director of Agriculture. Certain specific prohibitions, mainly against serious insect pests, have also been introduced in the interests of neighbouring territories.

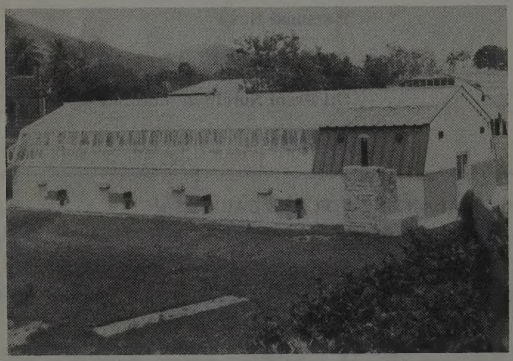
Since the producers of the major agricultural crops, viz., sugar, cacao, and coco-nut, and the minor crop, citrus, all work in full co-operation with the Government Department of Agriculture, the effect of these measures is that few permits for the private importation of economic plants are ever applied for and

that importations are made almost entirely either by the Department or by the I.C.T.A.

The present Central Quarantine Station, which was completed in 1952, comprises a glasshouse with six separate plant rooms (each with an air cooling unit), a large potting room and a store room, together with an adjacent plot of land for the field multiplication of plant material for local distribution.

Prior to 1952, no plants had been quarantined for a number of years owing to the dilapidated state of the old greenhouse. The erection of the new house led to vociferous demands from many territories for the introduction, particularly, of new sugar-cane varieties, consequently, a modified procedure was adopted specifically for sugar-cane; both modified and normal procedures are described.

A totally enclosed air-conditioned greenhouse has much to commend it from quarantine aspects. Under tropical conditions, however, effective air cooling in a closed, glass-roofed room is exceedingly difficult, and in fact the design of the present glasshouse leaves much to be desired. The shortcomings are traceable to five main causes: (1) inadequate rate of air replacement, (2) inadequate extraction of heated air from upper room levels, (3) the presence of a large volume of stagnant, hot air adjacent to the cooled rooms in the unventilated, uncooled potting room and central corridor, (4) inadequate cooling of the refrigerant by the air-cooled condensers, and (5) the compressors and units being placed inside the rooms instead of outside. The design of the roof precludes any major structural alteration but certain modifications are planned to rectify the main



The quarantine glasshouse in Trinidad, described in the accompanying article.

faults as funds become available and it is anticipated that a considerable improvement will be effected.

Each plant room receives a continuous fine water spray from three Tee-jet nozzles, and with these and the unit in action temperatures can be brought down to about 100-110°F. in full sunlight at midday. In the corridor and potting room temperatures of 135-140°F. have been recorded! Needless to say all work is done as far as is possible before the sun is up. The normal practice is to run the units at maximum cooling from 6 a.m. to 6 p.m. daily while the rooms are occupied. On overcast days — rarieties in Trinidad — it is sufficient to operate the unit fans only.

In the circumstances it is perhaps fortunate that the only plants that the Station has been called upon to quarantine since 1952 have been members of the Gramineae, viz., sugar-cane, forage grasses, and bamboos, for these appear to be remarkably tolerant of the arduous conditions within the greenhouse. Sugar-cane in particular has been grown very successfully and, indeed, cuttings grow quite happily for the first few weeks using spray and unit fans only. The principal snag is that unforeseen breakdown of the units, either mechanical or electrical, unless rectified promptly, leads inevitably to rapid and severe scorching of leaves which renders subsequent inspection for disease symptoms almost impossible.

All plants are grown in unsterilized compost contained in large galvanized iron tubs. Steam sterilization of compost was originally practised, but in 1950 the steam generating plant was condemned and reliance is now placed upon inspection

and chemical treatment to eliminate soil-borne pests and diseases. So far, this method has proved successful, the pests which occasionally appear in the pots being readily controlled with chlordane or aldrin.

Of seventy varieties of sugar-cane grown in the greenhouse since 1952 only two have exhibited disease symptoms necessitating their destruction. The remainder have made rapid but normal growth and have remained healthy, except when mechanical breakdowns occurred.

The normal procedure thereafter with sugar-cane is to establish new plants in the greenhouse from clean cuttings taken from the mature parent plants, and then destroy the latter. When this second generation is mature clean cuttings from these plants are distributed. It is not possible, however, to raise more than 18 to 24 tubs at any one time if overcrowding is to be avoided; in fact, with one unit usually out of commission the lower number is desirable for effective inspection. Moreover, potted plants produce relatively few tillers and the number of good cuttings obtainable is therefore small. In order to increase the supply of cuttings to meet the early heavy demands the procedure was modified temporarily, again relying upon regular and frequent inspection to reduce risks, by establishing cuttings from parent greenhouse plants out-of-doors in the field adjacent to the greenhouse. The plot is fairly isolated so the risks were not considered to be large, and the parent plants were destroyed in the normal way by incineration. Apart from one minor outbreak of chlorotic streak disease detected recently in a ratoon crop of one variety the plants in the field made good clean growth at all times and a more rapid out-turn of greenhouse material was achieved. We have now reverted to the normal procedure, which is, of course, safer.

Sugar-cane cuttings despatched from the Station are (a) hot air-treated in a thermostatically controlled Hearson oven at 54°C. for 8 hours, (b) dipped in Shirlan solution and allowed to dry, and (c) the cut ends sealed with candle wax. For short journeys taking more than 2 to 3 days the cuttings are individually wrapped in crumpled newspapers and then sealed in polythene bags before packing. This method, suggested by Dr. H.H. Storey, of E.A.A.F.R.O., has enabled cane cuttings to be sent successfully from Trinidad to Kenya, while Napier grass cuttings, similarly packed though taking six weeks en route reached Trinidad from Nyasaland in fair condition.

The procedure for other Gramineae follows that adopted for sugar-cane.

Cacao from countries other than Caribbean territories is brought into Trinidad only in the form of bud wood and is imported only by the I.C.T.A. Cacao Research Scheme, Botany Section. Plants raised from such material are subjected to inspection by the plant quarantine specialists. Until two years ago St. Vincent, which produces no cacao, was used as the site of an intermediate quarantine nursery for cacao, where selected clones from Trinidad were grown and propagated as cuttings for distribution within the Caribbean. For other Commonwealth territories intermediate quarantine of clones at Kew is the normal practice. Seed from clean pods is regarded as safe material for general distribution. Commercial plantings having now been established in St. Vincent it is proposed to transfer the nursery to Barbados. This move will facilitate the regular inspection of the nursery by the B.W.I. Cacao Research Scheme Staff, centred in Trinidad, since Barbados is more readily accessible than St. Vincent.

Bananas, other than wild forms imported as seed by the I.C.T.A. Banana Research Scheme, are permitted to be imported direct only from the Caribbean territories or, from other countries, after intermediate quarantine at Kew.

There is a total prohibition on citrus importation of any kind owing to the dangers of introducing tristeza and other maladies of citrus from which the Caribbean is singularly free.

The entry of raw coffee is also prohibited from all sources to prevent the introduction of Hemileia vastatrix and Stephanoderes.

Botany Department, I.C.T.A. J. Wilson

Dr. H.G. Thornton, Head of soil microbiology, Rothamsted Experimental Station has recently been elected Foreign Secretary of the Royal Society, and Profs. T.A. Bennet-Clark, Professor of Botany, King's College, London, and K. Mather, Professor of Genetics, Birmingham University elected to Council.

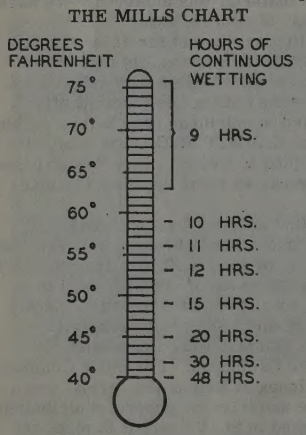
TIMING OF ORGANIC MERCURY-FUNGICIDE APPLICATIONS

by J. F. Hockey
Plant Pathology Laboratory, Kentville, N.S.

The spray programmes used in the apple orchards of Nova Scotia for the control of scab have undergone a radical change during the last ten years. Organic fungicides are rapidly replacing sulphur and copper materials as, through experience, the particular qualities and advantages of the new materials become fully understood. Timing of spray applications is being regulated more by the weather forecasts and the approach or passage of infection periods than by the stage of tree development. A method by which infection periods can be recognized has enabled orchardists to select and apply appropriate fungicides at a time when they are most effective.

Among the organic fungicides offered on the market today are several which are classified as eradicants because they are more effective when applied after than before periods of infection. These include some organic mercury materials and dichlone. Under conditions prevailing in Nova Scotia these materials have surpassed lime-sulphur in effectiveness for the control of apple scab.

The organic mercury fungicides have been recommended to and used by growers in emergency applications for the last five years. Such emergencies arise when an orchard does not have an adequate coverage with a protectant fungicide to carry it through an infection period. Such applications have been followed, usually within seven days, by a protectant material of the growers' choice. Although excellent control of scab has been obtained by this method there is some doubt whether such frequent spraying is necessary.



Apple scab infection periods. The diagram shows the approximate minimum number of hours of continuously wet foliage necessary for scab infection. The longer the period of wet weather, the more severe the infection. [From J. Fred Hockey. Studies in fruit diseases. IX Apple scab. Publ. Canada Dep. Agric. 519 (revision June 1953).]

During the last six years excellent control of apple scab has been obtained by the use of organic mercury fungicides when applications were confined to the post-infection periods. The identification of each infection period has been made by the use of the Mills' chart, a modification of which is included in diagram form in many spray calendars. This chart shows the number of hours of continuous wetting necessary at various temperatures to permit the infection of the host.

Applications of organic mercury fungicides are timed in the following manner: the first spray is applied immediately following the first infection period after the appearance of any susceptible new growth in the spring, and is considered to be effective for a seven-day period. The second spray is not applied until after a lapse of seven days and then only after a second infection period has occurred. Subsequent applications have been found unnecessary at intervals more frequent than ten days apart: when no infection periods have intervened there have been intervals of 26 days between applications. On several occasions there have been infection periods within the seven-day interval mentioned, but no additional sprays were used nor were they found to be necessary. The rainfall between successive spray applications has varied from 0·2 ins. to a maximum of 2·1 ins.

In other studies in Nova Scotia eradicants have been applied 112 hours after the start of an infection period and have given control of apple scab. Phenyl mercury acetate has been the most popular form of the organic mercurials but the phenyl mercury lactate and "fixtan" forms have also been used to some extent. Phenyl mercury chloride has been tested experimentally but is not commercially available in Nova Scotia. Dichlone has also been used in a post-infection schedule with good results when applied within 48 hours after the infection periods.

After the first year of testing post-infection period applications it was found desirable to change to a protectant fungicide for the applications subsequent to that made immediately after petal fall, in order to avoid russeting of fruit by the cover sprays. Furthermore, organic mercurials are not recommended for the later sprays on account of possible excess residue of mercury on the fruit. Ferbam, glyodin or captan have been most freuqently used.

The organic mercurials cannot be recommended for use on Cox Orange Pippin or Dolgo Crab in Nova Scotia as these varieties may be severely injured, nor has it been advisable to use organic mercurials for the cover sprays on varieties of the McIntosh group owing to the danger of fruit russeting. There has been no apparent decrease in fruit set from these treatments.

This method of timing the applications of fungicides for the control of apple scab may be quite unorthodox to the regular user of protectant fungicides. On the other hand, it is logical and reasonable to apply a fungicide when it is required. When a protectant fungicide is applied there is anticipation that it may serve a useful purpose according to the law of averages, but when an organic mercury fungicide is applied immediately following an infection period there is a certainty that it is essential for the control of scab.

The use of the seven-day interval as a minimum yardstick for timing applications of eradicant materials has indicated that the organic mercury fungicides not only eliminated infections from the previous infection period but have provided protection through infection periods immediately following their application. That control has been obtained by this method of timing indicates that the organic mercury fungicides exert a residual effect lasting for several days.

The timing technique used in this work may help reduce the number of spray applications, and hence the cost of spraying, in orchards where there is sufficient equipment to complete a single application within two days.

Bacterial Wilt in Europe

The following interesting information has been supplied by Dr. C. J. Briejer, Director, Plant Protection Service for the Netherlands, in response to a request from C. M. I.

Pseudomonas solanacearum was found by us on several plants in glasshouses in Holland. The symptoms are curling of the top-leaves followed by a downward bending of the lower petioles and more or less wilting of the leaves. The formation of little knots on the main stem is typical. In most cases the vascular bundles are stained brown. This is often visible on the surface of attacked stems as streaks. The stems may become hollow.

The bacteria were isolated and inoculation tests made during the summer of 1954. Plant tissue taken from the top of the diseased plants was inoculated in healthy plants. These gave the typical symptoms and we isolated the same bacteria. This technique was necessary as the virulence of the bacteria degenerates as soon as they are growing on nutrient media. We also inoculated with isolated bacteria, and in some cases the plants gave the above described symptoms.

As the morphological and cultural characters of the isolated bacteria corresponded with those given by Bergey's Manual of Determinative Bacteriology and Elliott's Manual of Bacterial Plant Pathogens we concluded that it must be Pseudomonas solanacearum. The disease has already been described in Norway, Belgium, France, Switzerland, and Austria.

In Holland this disease was probably confused with Verticillium wilt, or bacterial canker caused by Corynebacterium michiganense. Up till now we have no concrete information about the importance of it. The occurrence of the disease depends on the temperature and humidity in the glasshouses.

An illustrated article about this disease will appear in the yearbook for 1955 of the Plant Protection Service.

The Coply Medal for 1955 of the Royal Society has been awarded to Sir Ronald Fisher (R. A. Fisher) for his work on biometry.

INOCULATION MAST

Inaccessibility of the canopy from the ground has long hindered detailed study of the diseases of aerial parts of Hevea rubber trees over 1 to 2 years of age. The use of ladders is difficult as it is the outside of the canopy that is of interest, and it is also dangerous as inoculation work calls for the use of both hands and full attention. Scaffolding is clumsy and expenxive in materials, time, and labour, particularly as trees are usually away from the reach of mechanical transport.

To meet the need for a mobile and safe means of access to foliage we have designed a simple inoculation mast which, although of an obvious nature, may be of interest to readers of C.P. News as its design and dimensions have proved highly satisfactory in practice.

The mast is built of aluminium slotted angle in 10 ft. units. Each unit can be carried by one man and is a convenient size to transport on a lorry or even on the roof rack of a small car. When assembled the units are overlapped 12 ins.

The inoculation mast in position between two three-year-old budded Hevea trees. Steps for mounting to the platform can be seen on the far side of the mast.

and bolted together, so that each has an effective length of 9 ft.

The units are 18 ins. square in cross-section. If narrower than this it would not be possible to step inside: if wider, strength and manoeuvrability would be lost. Width is not required to ensure rigidity as the structure is not a tower but a mast dependent entirely on stay wires for its support.

One side of the mast is a series of steps 15 ins. apart of which every alternate step is one side of a square brace. No diagonals are required. The topmost three steps are omitted so that one can step into the tower on to a wooden platform, railed on three sides. The railings can be used to support note-books or as points of attachment for short lengths of angle to hold camera, sun-shade, mechanical spore trap, etc.

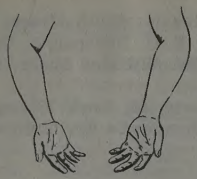
At the level of the platform the four stays are attached. They consist of a length (30 ft. in the case of the 20 ft. tower illustrated) of wire of the type used to support

(Continued on p. 13)

GOLD COAST AND T.V.T.

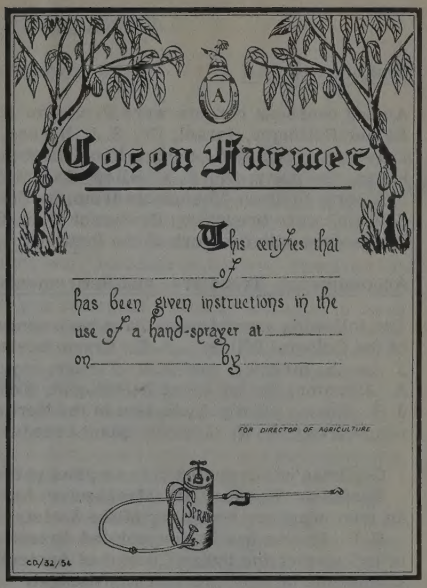
COCOA FARMERS!

No. 1 April 1955



HELP YOURSELVES AND PROSPER

TAKE CARE OF YOUR COCOA TREES



GP/W8414/30,000/2-55

Aids to better cocoa production on the Gold Coast (see p. 14)

Killing Capsid with MYSTO Sprayers

Upwards of 20,000 Mysto sprayers like this model 155 are now coming into use in West Africa. Strong and sturdy, they have been specially designed to meet local needs. A major task for them and for the modern insecticides they spray is the destruction of the Capsid Bug.

The manufacturers have a special department dealing with planters' needs. They will be glad to supply further details on request.

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PERSONAL NEWS

Visitors to C.M.I.

Among overseas visitors were Professor S.J. du Plessis, South Africa; Dr. Esther Hellinger, Israel; Dr. S.J. Hughes, Canada; K.B. Deshpande, Osmania University, and M.R. Subbra Rao, Bombay, India; Dr. Wilfried Lucke, Leverkusen, Germany; Dr. E.A. Riley, Tanganyika.

A party of about 25 students from the Botany Department, Royal College of Science, were brought by Professor P.H. Gregory to spend a day familiarising themselves with the work of the Institute.

Appointments, Transfers, and Retirements

The following appointments have been announced by the Overseas Service Division of the Colonial Office: A.C. Evans, assistant director (Research), Tanganyika; J. Lamb, director, and P.D. Turner, mycologist, W.A.C.R.I., Gold Coast; A. Johnston, Senior Plant Pathologist, Federation of Malaya; D. McDonald, and J.H. Simon, plant pathologists in the Northern and Western Regions of Nigeria, respectively; R.W. Gibbons, plant breeder, Northern Region, Nigeria.

G. Orian has resumed duty as plant pathologist, Mauritius.

Professor W. Wardlaw (Manchester) has succeeded Professor F.J.M. Stratton as joint honorary secretary of the Society for Visiting Scientists, London.

K.P. Biswas has been appointed director in charge of Medical Plants Scheme of India under the Indian Council of Agricultural Research and the Medical Plants Committee of the Government of Bengal.

W.D. Graddon has recently been elected president, and Dr. S.D. Garrett joint-editor, of the British Mycological Society. Dr. J. Webster and W. Buddin continue as honorary secretary and honorary treasurer, respectively.

Dr. G. Taylor has been appointed deputy chief scientific officer in the Botany Department, British Museum (N.H.).

The chair of Botany at St. Andrew's University, Scotland, has recently been accepted by Dr. J.H. Burnett.

As part of the expansion programme at the Royal College of Science, South Kensington, Dr. R.K.S. Wood has been appointed to the new post of reader in plant pathology of the University of London.

Dr. P.H. Lowings has been appointed lecturer in agricultural mycology at the School of Agriculture, Cambridge.

Dr. A. Riggenbach has been appointed plant pathologist, Rubber Research Institute, Ceylon, and has spent some two weeks studying at C.M.I.

F.W. Toovey has retired from the post of director, W.A.I.F.O.R., Nigeria, and has returned to England. C.W.S. Hartley is acting.

Dr. Esther Hellinger has retired from the post of chief mycologist and bacteriologist at the Daniel Sieff Research Institute, Rehovoth, Israel.

G.B. Portsmouth, until recently deputy director of the Tea Research Institute, Ceylon, has been appointed director.

Awards

Dr. K.M. Smith, director, Plant Virus Research Unit, Cambridge, has been awarded the C.B.E. in the New Year's Honours List.

Dr. J. Colhoun has been awarded the degree of D.Sc. (Queen's, Belfast).

OBITUARY

It is with much regret that we have to record the death of Mr. A. Ignatius Perera, C.B.E. (retired Postmaster-General of Ceylon), who has acted as Ceylon representative for the High Commissioner on the Executive Council of the Commonwealth Agricultural Bureaux since March, 1953. He was elected Vice-chairman of the Executive Council in July, 1955.

OVERSEAS NEWS

NOTES FROM CANADA

Leaf Diseases of Barley

In recent years leaf diseases appear to have been taking an increasing toll of the barley crop in Western Canada. These diseases are spot blotch (Helminthosporium sativum), net blotch (H. teres), and the so-called speckled leaf blotch (Septoria passerinii), all of which are most prevalent in the eastern part of the Prairie Provinces, and scald (Rhynchosporium secalis), a disease particularly prevalent in Alberta. In 1955, these four diseases were common on barley. Speckled leaf blotch was especially conspicuous on barley in southern Manitoba and reports from northern Minnesota and North Dakota indicated a similar situation in these states. On account of dry weather in midsummer its prevalence caused a rapid drying of the leaves. As a consequence, kernels were poorly filled and bushel weight low. In an experiment with S. passerinii at Winnipeg plots inoculated with this fungus yielded 20 per cent. less than the uninoculated plots.

Several factors that may have contributed to the increase of leaf diseases of barley in Western Canada have been suggested. An increase in acreage is one such factor and may have been of some importance in Alberta and Saskatchewan, but in Manitoba the area sown to barley has risen only slightly in recent years. Probably of more importance in Manitoba and parts of Saskatchewan is the increased acreage in malting barley, particularly of Montcalm, a comparatively susceptible variety. Another factor is the greater use of the combine harvester-thresher than formerly, coupled with present cultural methods. All these leaf-inhabiting fungi survive on stubble and on straw and leaf fragments. The combine ensures the uniform distribution of these infested fragments over the field. The shallow cultivation now usually practised to ensure a 'trash cover' leaves the plant debris on or near the surface of the ground and provides the fungi with excellent opportunities to infect the young seedlings shortly after they emerge from the soil. A further factor of considerable importance at the moment is the fact that for several years the weather in general has been cool and damp throughout the growing season, and rainfall abundant; moreover, a large portion of the crop has been seeded late. These conditions permit the fungi to flourish both on plant debris and on the living plants. Too little is known on the epidemiology of these diseases to predict their future importance.

In the meantime, for various reasons, the cultural methods now being practised are unlikely to be changed. Hence the chief hope of keeping these diseases under control lies in developing barley varieties that are less susceptible than those now grown.

There is some evidence that varieties differ in their susceptibility to one or more of these diseases. For example, the new varieties, Scott 169, Lethbridge 23 and Lethbridge 27 show marked resistance to scald. Moreover, this characteristic is inherited from their common parent, Glacier. The fact that resistance is a heritable character should provide opportunities of combining this resistance with other characters in the production of new varieties. Indeed, in those areas in which a particular disease is concentrated, the barley breeders are

THINKING IN PRINT

Spread of Antirrhinum Rust to Western Australia

The first Australian record of Puccinia antirrhini was at Sydney, N. S. W., in October, 1952. The disease spread rapidly and within a year was widespread in eastern N. S. W. and had been recorded in Victoria. A little later it appeared in Queensland, by January, 1954, had reached South Australia, and by March, 1954, Tasmania. In September, 1955, the disease was detected in Perth, Western Australia. Is this pathogen capable of unaided intercontinental dissemination? It is known that the rust appeared in New Zealand in December, 1953, and few Australian plant pathologists question the theory that the 1,000 miles hop from Australia was unaided. Its presence now in Perth, a possible unaided journey against a west-east airflow, tends to confirm suspicions regarding the Australia-New Zealand hop.

Dept. of Agriculture, New South Wales. C. J. Magee

already producing, by selection, hybrids that are less susceptible to the disease than the hybrids produced in areas where the disease is less prevalent. Thus, the barley hybrids produced in Manitoba have been found to carry little infection caused by H. sativum whereas those bred in Saskatchewan, where the organism is less prevalent, were heavily infected.

Recently, a joint programme was begun at the Plant Pathology Laboratories at Winnipeg and Edmonton to provide the plant breeders with more precise information on leaf diseases that would be helpful to them in their breeding programme.

Canada Department of Agriculture
Science Service,
Botany and Plant Pathology Division,
Ottawa.

I. L. Conners

AUSTRALIAN NOTES

Insect transmission of broad bean (Vicia faba) wilt: An unusual virus disease of the necrotic type which has become known as broad bean wilt was first described by L. L. Stubbs (J. Vic. Dep. Agr. 45, 1949) in Victoria and after being destructive in that State for some years practically disappeared. Later, the disease appeared in New South Wales, attacking besides broad beans, sweet peas and a wide variety of ornamental plants. The virus is sap transmissible, has a relatively wide host range, a thermal inactivation point of 58° to 60°C., and a longevity in vitro of 54 to 72 hours. Early attempts to determine its vector were unsuccessful, but Stubbs has recently announced that he has been able to transmit the virus with Myzus persicae, using a starvation and short-time acquisition feeding technique.

A widespread virus disease of Trifolium subterraneum: During May to July reports were received from widely separated areas in south-eastern Australia of a hitherto unrecorded disease of subterranean clover, an important pasture plant on which a nation-wide programme of pasture improvement is based. The diseased plants were stunted in growth and showed a marked reduction in size of the central leaves. These leaves had small blades with chlorotic margins. In some instances, 80 to 90 per cent. of plants in a stand were affected, some varieties more than others. The same or a very similar disease was observed also affecting other species of Trifolium, and also some Medicago spp. Although the symptoms of the disease somewhat resembled those of a nutrient deficiency, its widespread distribution on soils of many types led to investigations being directed towards establishing its virus nature. These investigations have been carried out at several centres in eastern Australia and there is now no doubt that one or more viruses are involved.

C. J. Magee

NEW ZEALAND NOTES

Notes have been received from Harvey C. Smith on the work at present in hand in Western Samoa for the control of diseases of cacao, of which black pod and canker due to Phytophthora palmivora are the most important. Fortunately, swollen shoot and witches' broom have not been seen in any areas visited, and strict quarantine measures to prevent their introduction are advocated.

Of particular interest is the observation that Lafi 7, although field-immune, was found to be somewhat susceptible to pod inoculation under laboratory conditions [see "News from New Zealand", C.P. News, Oct.1955, p. 60], and that a number of other cacao trees have been found with apparently much greater resistance. Selections of these have been made, and nursery propagation commenced.

Promising results have been obtained in spraying trials with Bordeaux mixture against black pod, using both stirrup pumps and mist blowers or swing fog machines, the last two on the bigger plantations. The best economic returns from spraying have been with trees carrying more than an average of 10 pods of which over 20 per cent. become blackened. Increases in yield of as much as 50 per cent. have been recorded. Good control has also been obtained by strict plantation hygiene and good pruning, and by removing papaws, which are also host

plants of P. palmivora, from the vicinity of cacao trees.

Dr. Harvey's last visit to Western Samoa was made to demonstrate to the Samoans the technique of spraying their cacao trees and to initiate large-scale spraying trials on the plantations owned by the Government.

"A total of approximately 250 acres in blocks ranging from 5 to 24 acres is being sprayed at three weekly intervals. The main objects of the trial will be firstly to compare bucket spray pumps (stirrup type) with mist-blower and swing-fog (S. N. 6.) machines for economy of operation and effectiveness in increasing the yield of cocoa, and secondly to compare Bordeaux mixture and cuprox in economy and effectiveness in control of black pod disease. The swingfog and mist-blower machines have been in operation in the field for several weeks and are able to cover the ground more quickly with a considerable saving in amount of fungicide applied. Preliminary estimates show the average cost per acre for each spray application to be £1 for bucket spray pumps and 10/- for swingfog machines."

Harvey C. Smith

AFRICA

Kenya

H. H. Storey and A. K. Ryland have reported the appearance of a new physiologic race of Puccinia polysora on maize at the E. A. F. F. R. O. research station, Muguga, Kenya. The origin of the new race is obscure as the nearest natural occurrence of P. polysora is 100 miles distant. It seems that the new pathogen may have arisen de novo in the glasshouse.

Nigeria

R. H. Cammack reports that since August this year he has been working on maize seedling reactions to Puccinia polysora collected from different regions of West Africa. Sources of inoculum from Nigeria (Ibadan) and Gold Coast (Accra) have given marked differential reactions. The typing lines used were derivatives of the present Mexico 13 variety, which has a high level of resistance to the local rust. There is little doubt that a new strain of P. polysora has appeared in West Africa, and it now remains to see if the forms there are the same as those isolated by Dr. Storey in Kenya.

Whether two, three, or four strains exist is uncertain but the present maize breeding programmes may possibly be seriously affected.

Gold Coast

Banana leafspot has been observed near Kumasi, and Cape Coast, and at Accra in the Gold Coast, and also at Kpeve in Togoland. So far the Cercospora stage only has been identified by the C. M. I.

Belgian Congo

A new quarterly journal, Folia Scientifica Africae Centralis, is being issued by the Institute for Scientific Research in Central Africa. It contains reports in French and Flemish with English summaries. There will also be published an annual bibliography of titles of new papers.

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OIL PALM NUTRITIONAL PROBLEMS IN NIGERIA
(continued from Vol. 1, p. 53)

by R.A. Bull, W.A.I.F.O.R.

Little-leaf Disease: This disease occurs in Nigeria and the Belgian Congo and is probably nutritional in origin. Experiments in the Congo have indicated that the little-leaf symptom is associated with boron deficiency (4).

The first symptom of little-leaf disease is the death of the central "spear" leaf, which becomes brown and desiccated and may remain upright for some time or rapidly collapse and hang down. Usually, there is a temporary cessation in leaf production after the spear has died and the next leaves to emerge are very short, usually not more than two or three feet long, with no pinnae. The next fronds are longer, and bear a few, much shortened, corrugated pinnae at the tip of the rachis. Successively longer leaves now emerge, bearing larger numbers of pinnae, abnormal at the tip of the rachis but normal at the base. Ultimately, leaves of a normal length with no abnormal pinnae are produced.

In Nigeria affected palms usually recover but may succumb to a second or third attack although the disease is rarely fatal; in parts of the Belgian Congo incidence and mortality rate are much higher.

In a unit fertilizer trial in the Congo (4) in an area where little-leaf was severe the disease was confined almost entirely to plots receiving complete fertilizer with the omission of boron, but the incidence of the disease was very low in the control plots (no fertilizer). In the latter case it seems likely that deficiencies of elements other than boron may have been restricting growth to a level where existing boron supplies were adequate.

Certain instances of little-leaf disease cannot be attributed to boron deficiency. Similar symptoms can result from mechanical damage to the bud or from non-lethal lightning strike.

The Problem of Multiple Deficiencies: Under tropical conditions, multiple mineral deficiencies may be more frequent than has been suspected hitherto as Webb (5) has shown in the Gambia, where fertilizer experiments on classical lines have given erratic results. Using a specially devised technique he was able to detect in Gambian soils no less than seven simultaneous deficiencies of varying degrees of severity. Multiple deficiencies may seriously reduce the value of fertilizer trials, and negative results must be interpreted with caution, for although a deficient element may have been supplied its corrective effect may be masked by the existence of additional uncorrected disorders. Furthermore, losses due to leaching and responses due to minor element impurities contained in commercial fertilizers may complicate interpretation. A knowledge of these factors is essential if reliable conclusions are to be drawn.

The Outlook for the Future

At W.A.I.F.O.R. considerable attention is now being given to nutritional problems and a special research unit is being set up for work on mineral nutrition. This unit will employ the techniques evolved at the Long Ashton Research Station, Bristol, during the past ten years. While research at W.A.I.F.O.R. will be concentrated primarily on the oil palm, results should prove of benefit to Nigerian agriculture generally.

Tolerances of the oil palm to specific deficiency or excess and the associated physiological conditions will be studied. In the field, leaf analyses and injection and spraying trials will be continued, especially in "plant failure" areas, and it may prove possible to gain valuable preliminary information on soil nutrient status by the use of indicator plants in combination with various fertilizer treatments, and particular attention will be paid to micronutrients.

If methods can be found for diagnosing mineral disorders in their early stages it should prove possible to devise economically feasible programmes for soil improvement which will be of considerable benefit to the oil palm industry, and indirectly, to West African agriculture as a whole.

Acknowledgments: The author is grateful to Mr. F.W. Toovey, Director, W.A.I.F.O.R. for permission to publish this article, and sincerely thanks Prof.

C.W. Wardlaw for the loan of the photograph.

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I.C.

A visitor to South Kensington cannot but be impressed by the vast amount of building taking place in Prince Consort Road. The old Imperial College of Science and Technology is steadily being transformed to a collossus whose cells are laboratories for science, engineering and technology.

In a recent report the RECTOR, Dr. R.P. Linstead, gives some glimpses of the great expansion planned for the next ten years both in modern facilities and in number of students.

Already I.C. trains one in nine of all students in science and industry for the whole of England, whilst as many as 40 per cent. of the degrees conferred are post-graduate. By 1962 it is visualised that there will be 3,000 students, of which 1,600 will be undergraduates, with 1,400 full-time post-graduates working mostly in technology. During 1953-54 only eight per cent. of the students were residential but by the end of the expansion period it is hoped to increase this figure to 16 per cent.

These developments are indicative of the trends of thought now permeating the Old Country and are a practical response to the stimulus provided by the anticipated 'bulge' in the numbers leaving the schools in the next decade. It is estimated that there will be an increase in the school population of 17 per cent.

Not only are the physical and industrial sciences being catered for but a programme of expansion has been arranged for the biological sections, of which Botany and Plant Pathology will receive their share. It is hoped to publish further details about this in the July issue of C.P. News.

(Continued from p. 6)

telegraph poles, and are looped at the end so that a 5 ft. length of $1\frac{1}{2}$ ins. diameter water-pipe can be passed through and driven into the ground.

The mast can be taken down and re-erected 100 yards distant by two labourers in 15 minutes. Dismantling for carriage over longer distances naturally takes more time.

It is intended to increase the height of the mast to 30 or even 40 ft. on the same principle of construction, possibly using extra stays. The 20 ft. mast has been used for work on pink disease (Corticium salmonicolor) and for observations on insects visiting Hevea flowers. One of a greater height would be invaluable for studying the life history of Oidium heveae.

Pathological Division, R.N. Hilton
Rubber Research Institute of Malaya,
Kuala Lumpur.

Plant Protection Ltd. are organising a second international conference on plant protection at their research station at Fernhurst, Surrey, from 18th to 22nd June, 1956.

The Proceeding of the National Institute of Sciences in India will in future be published bi-monthly in two parts: A, physical sciences and B, biological sciences, the parts appearing alternately.

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MISCELLANEOUS NEWS

CONFERENCES

At the International Rust Conference held at Winnipeg, Manitoba, in January, 1953, the proposal was made to hold a similar conference in about two years' time in Mexico. Plans were nearing completion for holding the next conference in Mexico City in September, 1955, when postponement was found necessary until March, 1956. Delegates to this conference are expected from the United States, Canada, Mexico, and several South American countries. It is being held at the invitation of the Mexican Department of Agriculture, and with the assistance of the Rockefeller Foundation.

It is announced in the News Bulletin of the British Mycological Society that the date of the European Mycological Congress, 1956, has been changed to 15th to 22nd September.

The 1955 Cacao Conference

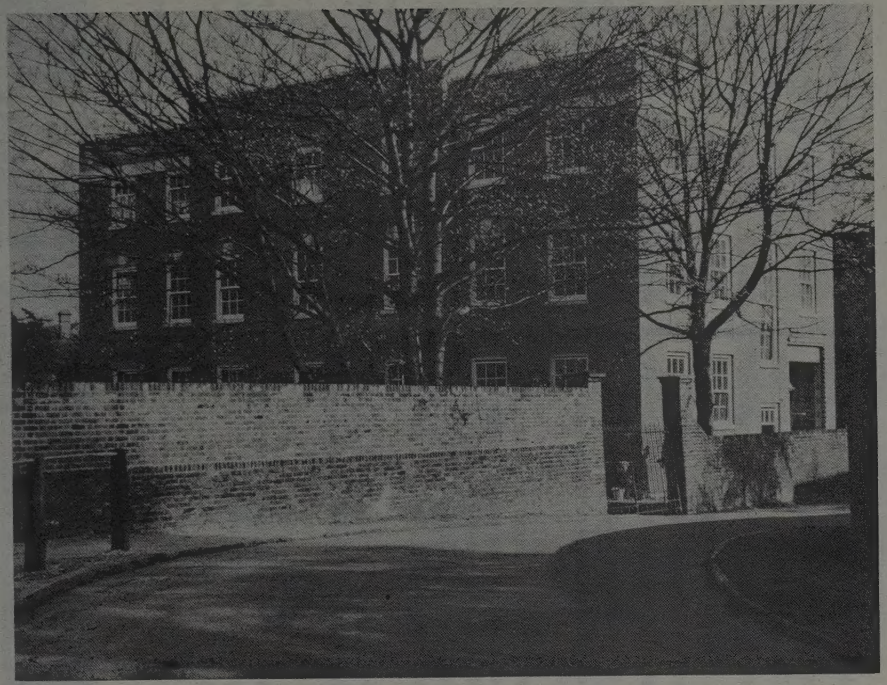
Representatives came from West Africa, Trinidad, the United States, Central and South America, and Malaya, and discussed world cacao problems. Mr. J. O. Broatch, Deputy Director of Agriculture, Gold Coast, read a paper on disease and pest control and on plans for the rehabitation of the Cocoa Industry in the Gold Coast.

As Mr. Jantuah, Minister of Agriculture in the Gold Coast, said in his address to the conference at luncheon the Department of Agriculture is waging an intensive campaign against swollen shoot disease planned in collaboration with the Department of Social Welfare and Community Development. Mr. Broatch explained that the new campaign aimed at explaining and emphasizing, by new instructional methods [see p. 7], a number of simple practical measures for controlling diseases and pests and for increasing production. For this purpose sixteen publicity teams have been constituted and by March, 1956, it is hoped that almost all the villages in the cacao areas will have been visited. The advisory service of the Department of Agriculture is being consolidated and extended. The general policy of cutting out trees affected by swollen shoot remains but it is hoped to reduce the present excessive cost by educating the farmer to carry out his own treatment. Up to June, 1955, over 40,000,000 diseased trees had been cut out on 92,321 cocoa farms, the maximum number of 1,053,816 being destroyed in January, 1955. There was a more optimistic view taken generally at the Conference than heretofore regarding the success of the cutting out campaign.

The encouraging results obtained against black pod (Phytophthora palmivora) by using a copper fungicide in Nigeria did not hold good for the Gold Coast where other tried methods of reducing losses, namely early removal of diseased pods and frequent harvesting were superior.

Mr. Hadland and Mr. Reeves gave an account of the training facilities provided in Nigeria for farmers wishing to spray against black pod. By May, 1955, 10,768 farmers had been trained and while the effect of spraying on production cannot be accurately assessed it will be disappointing if an increase of 6000-7000 tons is not obtained.

Among other subjects discussed by the conference was the method devised by Mr. R. V. Wadsworth for assessing the quality of the fermented product, an important advance that promises to be of great use to investigators.



The New Block just before completion

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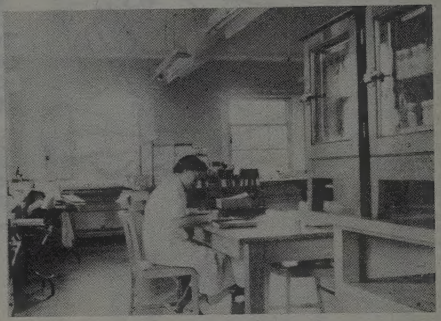

The Culture Collection Laboratory

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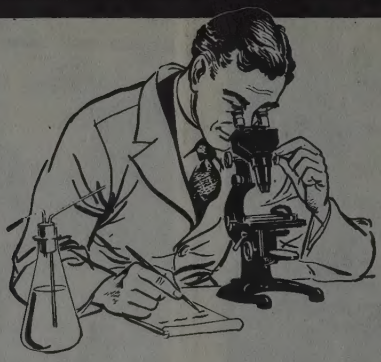

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'PERECLOUD' 4%—for use in place of 'Perenox' on tea where a dust is preferred.

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Full details of these and other Plant Protection products are obtainable from: Plant Protection Ltd, Export Dept., Bolton House, 61 Curzon Street, London, W.1

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